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ABSTRACT

To clarify the effects of noise, sex, and intelligence on student performance, 289 sixth-grade students were randomly assigned either the Standard Progressive Matrices (SPM) or the STEP Reading Test Form 3 (STEP III) to be taken under high- or low-noise classroom conditions, with gender and intelligence as variables. Students who took the SPM while listening to low levels of previously recorded classroom noise performed better than did students in the high-noise-level group. When below-average intelligence students took the STEP III under high-noise conditions, their test scores improved, while above-average intelligence students performed best on STEP III when noise levels were low. Students with above-average intelligence did significantly better on both tests, in both noise settings. This study supports the contention that the effect classroom noise has on student performance depends on the task involved, but does not support previous findings that suggested sex was a significant variable in determining student performance under various noise-level conditions. (Author/DCS)

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The Effects of Classroom Noise on Student Performance

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Running head: CLASSROOM NOISE

Abstract

Sixth-grade students (n = 289) were randomly assigned to one of eight groups defined by the possible combinations of two classroom noise conditions (40 dbA vs. 70 dbA), two gender conditions (male vs. female), and two intelligence level conditions (above average vs. below average). Students were then randomly assigned to be administered either the Standard Progressive Matrices (SPM) or the STEP Reading Test, Form 3 (STEP III). Students in the low noise group performed better on the SPM than did students in the high noise group. For the STEP III scores, there was an interaction between intelligence level and noise level. No evidence for sex differences was found for either test. The results did not support previous findings concerning an interaction between noise level and sex.

The Effects of Classroom Noise on Student Performance

Research concerning the effects of classroom noise on student performance has resulted in conflicting reports. For example, Broadbent (1958), Jerison (1959), and Lehmann, Creswell, & Huffman (1965) reported that noise has a negative effect on performance. However, Park & Payne (1963) and Slater (1968) found that performance is not significantly affected by noise level. In spite of this body of conflicting research, many schools have moved from traditional arrangements toward "open" settings (Rivlin & Rothenberg, 1976) which produce relatively high levels of classroom noise. Still other schools have spent funds for acoustical control in the classroom (Cohen, Evans, Krantz, Stokols, & Kelly, 1981). Therefore, one purpose of the current research is to examine the effects of classroom noise on student performance with respect to various intellectual tasks.

Christie & Glickman (1980) and Ollila & Chamberlain (1975) reported that girls tend to perform best under relatively quiet conditions while the performance of boys is either not affected or improved by the presence of noise. Since these studies suggest that boys are more tolerant of noise than are girls, a second objective of the present research is to examine the

effects of sex and noise on performance under classroom conditions.

A third variable included in the current research is intelligence level since results reported by Hartman (1946) and Zentall & Shaw (1980) indicate that task performance may be a joint effect of student intelligence level and classroom noise level.

Two performance measures were used in this study. One measure was the 1958 version of the Standard Progressive Matrices (SPM). Although Court's (1983) comprehensive literature review revealed no differences in SPM performance due to sex, this measure was chosen because Christie & Glickman (1980) reported a significant interaction between noise and sex using SPM scores as the dependent variable. The second measure selected was the STEP Reading Test, Form 3 (STEP III). Slater (1968) found no significant performance differences on the STEP III as a function of either noise or sex.

A comparison of Christie & Glickman (1980) and Slater's (1968) findings suggests that the effects of classroom noise on performance depends on whether the task involves verbal or analytical abilities. The present study used a factorial design in an attempt to clarify the effects of noise, sex, and intelligence on SPM and STEP III performance.

Method

Subjects

The subjects were 156 females and 133 male sixth-grade children enrolled in Richmond County (Georgia) schools. The high intelligence subjects consisted of 98 females and 61 males who scored at or above the 51st percentile on the Otis-Lennon Mental Ability Test (Form J, Intermediate Level) while low intelligencesubjects consisted of 58 females and 72 males who scored at or below the 50th percentile.

Procedure

Subjects were randomly assigned to be administered either the SPM or the STEP III test. Students administered the SPM were randomly assigned to one of the two noise conditions except for the constraint that representation of males and females and of intelligence levels be as equal as possible in each group. The same assignment procedures were used for the students who were administered the STEP III.

A Bruel Kjaer (Model 2203) sound level meter was used to calibrate noise levels so that a previous recording of classroom activity could be played at average decibel levels of 40 dbA and 70 dbA. Each group was tested by the same experimenter. Administration time for each of the two tests was 45 minutes.

Results

A 2 (noise level: 40 dbA vs 70 dbA) x 2 (sex: male vs. female) x 2 (intelligence level: high vs. low) unequal *n* analysis of variance was performed using the number of correct answers on the SPM and STEP III as dependent variables. The analysis of the SPM scores yielded a significant main effect for noise level, F (1, 131) = 4.69, $p < .03$, indicating that performance in the low noise condition was significantly better than performance in the high noise condition. As expected, students who had high intelligence test scores performed significantly better than students who had low intelligence test scores. No other significant effects were found for the SPM scores.

For the STEP III scores, a significant main effect was associated with level of intelligence. In addition, a significant interaction between noise level and intelligence level, F (1, 128) = 7.69, $p < .01$, indicated that students with above average intelligence scores performed better in the low noise condition as compared to the high noise condition while students with below average scores performed better in 70 dbA noise than in 40 dbA noise. Group means and standard deviations for both tests are shown in Table 1.

Insert Table 1 about here

Discussion

The results support the contention that the effect of classroom noise on student performance varies according to the task involved. No evidence for sex differences was found with respect to scores on either the SPM or the STEP III. The STEP III results are similar to those reported by Slater (1968) except that Slater did not examine pupil intelligence as an independent variable. Further research is needed to clarify the effects of intelligence and classroom noise on student performance.

The results of the present study agree with the findings of Bronzaft (1981) and Slater (1968) and do not support the conclusions of Christie and Glickman (1980) that intellectual performance is a non-additive function of sex and noise. In the Christie and Glickman (1980) study, different experimenters tested the children assigned to the various treatment combinations. This arrangement may have produced an interactive effect that influenced the behavior of the subjects and thus the experimental data. Furthermore, the students were tested

individually behind partitions, thus producing artificial classroom conditions. Christie and Glickman suggest that "it appears that an optimal learning environment for boys would be relatively noisy, while girls tend to perform better in a quiet environment" (p. 408). The results of the present study indicate that such a suggestion is premature.

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TABLE 1

MEANS AND STANDARD DEVIATIONS FOR SPM AND STEP III

		Above Average IQ		Below Average IQ	
		Males	Females	Males	Females
SPM	40dbA	42.9	44.4	29.3	30.2
		(2.5)	(4.8)	(4.5)	(3.8)
	70dbA	43.6	42.3	25.9	27.4
		(5.9)	(3.8)	(6.8)	(7.6)
STEP III	40dbA	44.2	44.3	26.3	28.6
		(4.3)	(2.8)	(4.9)	(4.6)
	70dbA	41.9	42.2	28.6	30.5
		(4.3)	(3.4)	(5.2)	(6.6)